

Code: EC4T4

**II B.Tech - II Semester – Regular / Supplementary Examinations  
October 2020**

**ELECTRO MAGNETIC FIELDS AND WAVES  
(ELECTRONICS & COMMUNICATION ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

**PART – A**

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

1.

- a) Give the Cylindrical co-ordinates of the point whose Cartesian coordinates are  $x=3$ ,  $y=4$ ,  $z=5$ .
- b)  $A=10a_x+4a_y+6a_z$  and  $B=2a_x+a_y$  find the Cross product of these two vectors.
- c) State Divergence theorem.
- d) State Coulombs law.
- e) Define Gauss Law.
- f) Write Maxwell third equation.
- g) Define Self inductance.
- h) What is Boundary condition?
- i) Explain displacement current in brief.
- j) What is Attenuation?
- k) What is Skin depth?

## PART – B

Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) State and prove Stokes theorem. 6 M

b) Define Divergence and explain the concept of divergence with relevant mathematical equations. 10 M

3. a) Calculate the force on a point charge of  $30\mu\text{C}$  located at a point  $(0,0,1)\text{m}$  when four point charges each of  $10\mu\text{C}$  are placed in free space at the points  $(1,0,0)\text{m}$ ,  $(-1,0,0)\text{m}$ ,  $(0,1,0)\text{m}$  and  $(0,-1,0)\text{m}$  respectively. 10 M

b) A parallel plate capacitor has a plate area of  $1.5\text{m}^2$  and a plate separation of  $5\text{mm}$ . There are two dielectrics in between the plates. The first dielectric has a thickness of  $3\text{mm}$  with a relative permittivity of 6 and second has a thickness of  $2\text{mm}$  with a relative permittivity of 4. Find the capacitance. 6 M

4. a) State and explain Biot Savart's Law. 6 M

b) Each of the square coils has 100 turns and a length of  $25\text{cm}$ . The dimensions of the coils are  $1.2 \times 1.2\text{cm}$  and  $3 \times 3\text{cm}$  respectively. With the inner coil and core removed and a current of  $1\text{mA}$  established in the outer

- coil, determine the magnetic field intensity within the outer coil, neglecting fringing. And also calculate the self Inductance of this coil. 10 M
5. a) Explain the concept of ‘Stationary loop in time varying magnetic field’ and ‘Moving loop in static magnetic field’ with relevant mathematical equations. 10 M
- b) Write short notes on Time harmonic fields. 6 M
6. a) Explain the reflection of a plane wave at Oblique incidence. 8 M
- b) Discuss the concept of Wave polarization. 8 M